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Research Article

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Effect of integrated nutrient management on major nutrient of soil in rajmash in acid soil of Nagaland

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Summary

The experiment was conducted during the *Kharif* season of 2012 and 2013 at demonstration field of Krishi Vigyan Kendra (KVK) at Porba village, Phek district, Nagaland to study the effect of integrated nutrient management on soil major nutrients of rajmash in acid soil of Nagaland. The experiment showed that the integrated treatments involving both organic and inorganic fertilizer influenced favourably the fertility status of the soil as compared to the control. Maximum increase in available N in soil (331.26 kg ha^{-1} in 2012 and 324.11 kg ha^{-1} in 2013) was found with T_{18} (5 ton FYM + biofertilizer + lime+ 100% NPK). Available P content of the soil showed significantly higher value in all treatments over the initial value. Among the treatments, the treatment receiving 5 ton FYM + biofertilizer + lime + 100% NPK in both the experimental year showed the highest P content of the soil. For available K too, maximum K content in the soil was recorded in the treatment T_{18} receiving 5 ton FYM + biofertilizer + lime + 100% NPK in both the years.

Key words : INM, Available N, P, K, *Phaseolus vulgaris* L.

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Introduction

Cultivation of pulses is gaining importance all over the World due to their increasing demand and high market value. In India, pulses are grown mostly on marginal and sub-marginal lands without proper inputs occupying first in pulse production with 23 Million hectare. Among pulse crop, rajmash is becoming popular with the farmers due to its high profit in comparison to other pulses and unlike other pulse crop. Rajmash is a stable cash crop free from insect pests and diseases. Rajmash (*Phaseolus vulgaris* L.) belongs to the Leguminasae family and is also known as French bean, kidney bean, common bean. Rajmash is consumed as green vegetables as well as grain pulse. For vegetable purpose, round podded type with more flesh and less string is preferred. Among all the beans, it is the most extensively grown bean because of its short duration and nutritive value. It is a valuable source of protein, vitamins and minerals (Ramana *et al*., 2011). Integrated nutrient management (INM) envisages the use of chemical fertilizers in conjunction with organic manures, legumes in cropping systems, use of biofertilizer and supply and use of plant nutrients from chemical fertilizers and organic manures has shown to produce higher crop yields than when each is applied alone. Hence, integrating their use in soil fertility management is a must. Integration of chemical and organic sources and their management have shown promising results not only in

sustaining the productivity but have also proved to be effective in maintaining soil health and enhancing nutrient use efficiency (Laxminarayana *et al*., 2011 and Kumar *et al*., 2012).

The present experiment was undertaken to study the effect of integrated nutrient management on soil major nutrient status of soil of rajmash in acid soil of Nagaland.

Resource and Research Methods

The experiment was conducted during the *Kharif* season of 2012 and 2013 at the demonstration farm of Krishi Vigyan Kendra at Porba Village, Phek district, Nagaland. The farm is located at latitude of 25°62'N and longitude of 95°33'E and at an elevation of 1842 m above the mean sea level. The experiment was laid out in Randomized Block Design (RBD) with three replications. The treatments comprised of 18 treatments *viz*., T_1- control, T_{2-} 50% NPK, T_{3-} 100% NPK, T_{4-} biofertilizer, T_5 - biofertilizer + 50% NPK, T_6-biofertilizer + 100% NPK, T_7- biofertilizer + lime, T_8-biofertilizer + lime + 50% NPK, T_9- biofertilizer + lime + 100% NPK, T_{10} - 5 ton FYM, T_{11} -5 ton FYM + 50% NPK, T_{12} –5 ton FYM + 100% NPK, T_{13}- 5 ton FYM + biofertilizer, T_{14}- 5 ton FYM + biofertilizer + 50% NPK, T_{15}-5 ton FYM + biofertilizer + 100% NPK, T_{16}- 5 ton FYM + biofertilizer + lime, T_{17}- 5 ton FYM + biofertilizer + lime + 50% NPK and T_{18-} 5 ton FYM + biofertilizer + lime + 100% NPK. Different doses of nutrients were applied through different sources as per the need of the treatments. The recommended level (100%) of N (Urea), P (Single super phosphate) and K (Muriate of potash) are100, 40 and 20 kg ha^{-1}, respectively. Initial values of soil before sowing were recorded as available N-238.55 kg ha^{-1} (Alkaline Potassium Permanganate method) and available P-8.20 kg ha^{-1} (Bray and Kurtz, 1945) and available K- 128.5 kg ha^{-1} (Neutral normal ammonium acetate extract of soil). Soil samples were collected before sowing and after harvest of rajmash and analyzed as per standard methods.

Research Findings and Discussion

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Major nutrient of soil :

Results on status of available N, P and K of the soil at the end of the cropping sequence are presented in the Table 1. By and large, integrated treatments improved available nutrient status of soil of soil as against chemical treatments.

Available nitrogen (kg ha^{-1}) :

Pooled data revealed that the maximum available N (327.69 kg ha^{-1}) was also obtained from 5 ton FYM + biofertilizer + lime + 100% NPK while control recorded the minimum available N (234.55 kg ha^{-1}).

In general, the available N was found to be higher in the integrated treatments *vis-à-vis* chemical treatments after the harvest of rajmash crop. This might be due to increase in organic matter content of the soil which undergoes mineralization coupled with hydrolysis of urea creating a favourable condition for residual N balance in soil. Such an increase in available N was also observed by Bhandari *et al*. (1992) and Duraisami *et al*. (2001).

Available phosphorus (kg ha^{-1}) :

Available phosphorus content in soil as affected by different treatments is presented in Table 1. Data on available P content of soil showed that different treatments significantly influenced the available P content of the soil. Initial available P content of the soil as recorded in 2012 was very low as (8.20 kg ha^{-1}). Further analysis from the pooled data revealed that the maximum available P (21.39 kg ha^{-1}) was obtained from 5 ton FYM + biofertilizer + lime + 100% NPK while control recorded the minimum available P (10.19 kg ha^{-1}). In the integrated treated plots available P content of soil was found to be increased over the initial value which might be due to decomposition of organic manure, various organic acids will be produced which solubulize phosphatase and other phosphate bearing minerals and thereby lowers the phosphate fixation and increase its availability. Such an increase in available P was also observed by Manna *et al.* (2006) and Vidyavathi *et al*. (2011).

Available K (kg ha^{-1}) :

The result presented in the Table 1 showed that there was a significant influence of treatments on available K content of soil. Data from the pooled analysis revealed that the highest available K (162.06 kg ha^{-1}) was recorded in the treatment T_{18} (5 ton FYM + biofertilizer + lime +50% NPK) while the lowest (123.59 kg ha^{-1}) was recorded in the treatment T_1 (control).

There was an increase in exchangeable K content

Table 1: Effect of integrated nutrient management on available N, P and K of rajmash (mean data of 2 years)

Treatments	Available N (kg ha^{-1})	Available P (kg ha^{-1})	Available K (kg ha^{-1})
T_1- Control	234.55	10.19	123.59
T_2- 50% NPK	252.97	12.09	132.23
T_3- 100% NPK	267.10	13.14	147.94
T_4- Biofertilizer	273.18	11.87	128.30
T_5 -Biofertilizer + 50% NPK	276.75	12.96	133.82
T_6- Biofertilizer + 100% NPK	281.27	13.44	150.42
T_7- Biofertilizer + lime	283.90	12.65	133.46
T_8- Biofertilizer + lime + 50% NPK	287.55	13.42	138.15
T_9- Biofertilizer + lime + 100% NPK	288.79	13.81	151.02
T_{10} – 5 ton FYM	290.77	12.97	134.48
T_{11} –5 ton FYM + 50% NPK	291.99	14.41	146.45
T_{12} –5 ton FYM + 100% NPK	300.51	15.04	153.59
T_{13}- 5 ton FYM + biofertilizer	296.39	14.38	141.25
T_{14}- 5 ton FYM + biofertilizer + 50% NPK	290.84	14.97	149.29
T_{15}- 5 ton FYM + biofertilizer + 100% NPK	304.42	15.55	155.92
T_{16}- 5 ton FYM + biofertilizer + lime	301.38	14.58	141.82
T_{17}- 5 ton FYM + biofertilizer + lime+ 50% NPK	313.04	16.90	159.19
T_{18}- 5 ton FYM + biofertilizer + lime+ 100% NPK	327.69	21.39	162.06
Initial value	-	-	-
S.E.±	2.99	0.35	1.64
C.D. (P=0.05)	8.59	1.00	4.70

of the soil under integrated treatments might be due addition of organic matter that reduced K fixation and released K due to interaction of organic matter with clay, besides the direct K addition to the pool of soil (Urkurkar *et al*., 2010 and Subehia and Sepehya, 2012).

Based on these results, it can be concluded that treatments involving use of 5 ton FYM + biofertilizer + lime + 50% NPK (T_{17}) may be recommended for growing rajmash in the acid soil of Nagaland.

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